

second plurality of slices having a low resolution in the second direction and a high resolution in directions orthogonal to the second direction;

- (c) registering the first plurality of slices with the second plurality of slices to define a matrix of isotropic, high-resolution voxels having unknown high-resolution voxel values; and
- (d) solving for the unknown high-resolution voxel values in the matrix defined in step (c) in accordance with the image data taken in steps (a) and (b) to form the image.

12. (Amended) The method of claim 1, wherein step (d) comprises treating the image as a linear combination of at least two low-resolution functions and deriving the unknown high-resolution voxel values from the image data of the first and second pluralities of slices.

28. (Amended) A system for forming an isotropic, high-resolution, three-dimensional image of a subject, the system comprising:

scanning means for (i) scanning the subject in a first direction relative to the subject to take image data of a first plurality of slices, the image data of the first plurality of slices having a low resolution in the first direction and a high resolution in directions orthogonal to the first direction, and (ii) scanning the subject in a second direction relative to the subject which is different from the first direction to take image data of a second plurality of slices, the image data of the second plurality of slices having a low resolution in the second direction and a high resolution in directions orthogonal to the second direction; and

computing means for (i) registering the first plurality of slices with the second plurality of slices to define a matrix of isotropic, high-resolution voxels having unknown high-resolution voxel values and (ii) solving for the unknown high-resolution voxel values in the matrix defined by the computing means in accordance with the image data taken in the first and second directions by the scanning means to form the image.